boys who receive commissions immediately on leaving school are devoting their time to the dead languages, and enter the Army without a scrap of scientific knowledge. Any headmaster who permits this state of things to continue is an enemy both to the boys and to his country.

One difficulty to be encountered is that many science teachers may not be familiar with the matters covered by the syllabus; but by reference to the publications recommended, supplemented by a further list compiled by Mr. Bryant, they will soon acquire the necessary information. No diffidence need therefore be felt on this score; and the teacher who adopts the scheme will have the satisfaction of knowing that he is rendering the highest service to his country.

Work in public schools, however, is only one aspect of the question. There are at present in our armies hundreds of officers who stand in need of instruction, and non-commissioned officers and picked men must also be considered. It is here that our universities, colleges, and technical schools may do invaluable work. It is not possible in these cases, owing to considerations of time, to treat the subjects in the same detail as with boys at school or at Woolwich. From my own experience, however, I can confidently state that twenty hours' tuition, devoted solely to the subjects named, will give any intelligent beginner a grasp of the matters under notice, sufficient to enable him to apply his knowledge to his duties, and so to increase in competence with practical experience. Work of this character has already been conducted with success at the Finsbury Technical College, the Northampton Institute, Clerkenwell, and the Norwich Technical Institute; and if made general throughout the country an incalculable amount of good might be done. At the present juncture, the War Office could not be expected to organise such a scheme, and everything must therefore depend upon the initiative of the individual teacher. To start a class he should approach the officer commanding troops stationed in his locality with an offer to give instructions on the lines suggested by the Director of Military Training. An arrangement may be arrived at for a number of officers, N.C.O.'s, or selected men to attend at specified times; twenty being the average number who may be dealt with to advantage. The teacher must expect neither financial reward nor official recognition, nor assistance in the matter of equipment. Everything will depend upon his own voluntary efforts.

With regard to a syllabus for intensified instruction of this kind, details of apparatus, and sources of special information relating to the subjects taught, I should be pleased, subject to the consent of the editor, to supply these through the columns of NATURE, provided a demand should exist. I appeal most earnestly to all teachers of physics and chemistry, in the interests of the country, to take up this work without delay. One class will suffice to bring home to a teacher the good he can do at the present crisis. With the view of organising future work on the most effective lines I should be glad if all who commence classes would notify me, stating the subjects taught.

We are at present devoting all our attention to the quantity of men in our armies, forgetting that quality is at least equal in importance, and that science alone can prevail against science. Speaking at the recent meeting of Public School Science Masters, an officer returned from France stated that "to his own knowledge hundreds of lives had been needlessly lost through the lack of information that should be in the possession of every officer." It lies within the power of the science teachers of England to impart a portion, at any rate, of this much-needed knowledge; and it cannot be questioned that a united effort on their part, if promptly made, would be of inestimable service to their country.

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A Relation between Atomic Weights and Radio-active Constants.

CONSIDER the group of chemically identical (isotopic) elements:—

	Approximate atomic weight		Range of α particles
Radium A ...	$\omega=218$	...	$a=4{\cdot}50$ cm.
Thorium A ...	216	...	5·40
Actinium A ...	214	...	6·16
Radium C′ ...	214	...	6·57
Thorium C′ ...	212	...	8·16
Polonium (Ra. F)	210	...	3·58

If log ω be plotted against log α the points will be found to lie along a straight line:—

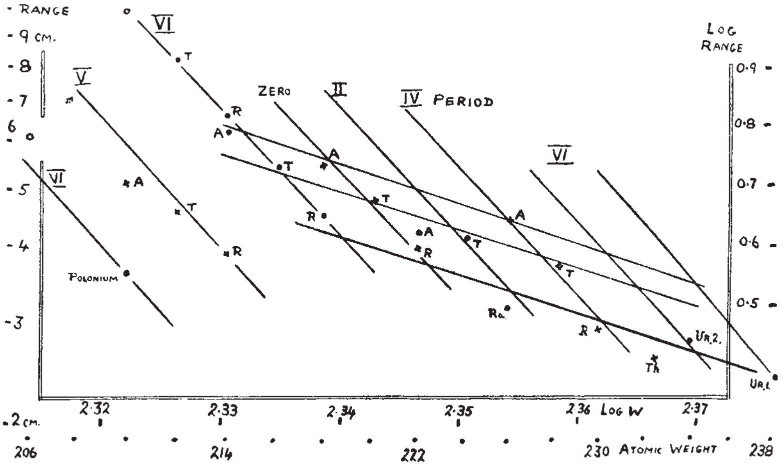

FIG. 1.—The radium elements are all marked R. The thorium elements are all marked T. The actinium elements are all marked A.

The two circles are the exterpolated points referred to in the text.

Fig. 1 shows log α for all the known α-ray elements, as follows:—

Dots.	Period VI.	Uranium 1 (atomic weight 238). Uranium 2 (234).
Crosses.	Period IV.	Thorium (232). Actinium (230). Radio Thorium (228). Radio Actinium (226).
Dots.	Period II.	Radium (226). Thorium X (224). Actinium X (222).
Crosses.	Zero Period.	Emanations from Radium (222). Thorium (220). Actinium (218).
Dots.	Period VIB	Radium A (218). Thorium A (216). Actinium A (214). Radium C′ (214). Thorium C′ (212). [Actinium C′ 210 unknown.]
Crosses.	Period VB	Radium C (214). Thorium C (212). Actinium C (210).
Dots.	Period VIB	Polonium=Radium F (210). [Possible actinium element. 206.]

Though some of the lines are somewhat straggling, still each group of isotopes gives a line, and the lines are approximately parallel and equally spaced. The range is thus universally proportional to about the 21st power of ω in each case. Moreover, the groups follow one another in a rational order, Period No.

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VI. of the periodic table being followed by Nos. IV., II., and zero, and then by Nos. VIB and VB.

In period VIB polonium appears to be the starting-point of a new line, the thorium and actinium elements of which are still unknown. No further products of Act C are known corresponding to the polonium branch of the radium series, and Act C., if it existed, should, by Fig. 1, have the record range of about 10 cm. About 0·17 per cent. of the Act C rays are, however, said to have a range of 6·1 cm., which would be fairly suitable to an element of at. wt. 206 on a line drawn parallel to the others on Fig. 1 starting from polonium.[1]

It is specially noticeable that to make the actinium points lie on the same lines as the corresponding radium and thorium elements, its atomic weight must be reckoned in every case from actinium = 222 instead of 226. This means that the actinium series branches off from the uranium stock at Ur(2) instead of at Ur(1). Either scheme is equally allowable, but no evidence has hitherto been brought forward to decide between them.

Another set of lines can be drawn on Fig. 1, one through the actinium points, one through the thorium points, and the lowest through the uranium elements. The latter are, however, very scattered, and include thorium itself amongst them. The lines do not go beyond the "A" elements.

These relationships were detected from noticing first the evident family resemblance between the γ rays in the isotopic groups. For example, in period IVB we have:—

	"K" Series	"L" Series	Soft Rays	β Rays
Ra B	0·19	14·7	85	75
Th B	0·13	11·8	59	110
Act B	0·17	11·5	44	—
Ra D	0·36	16·7	—	130
Lead	—	17·4[2]	—	—

Among the β rays something of the sort is noticeable, μ generally falling with increasing atomic weight, but for the very soft (β) rays μ is directly proportional to the 33rd power of ω.

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December 14, 1915.

The Naming of Earthquakes.

AN earthquake is usually distinguished by the name of the town, province, or country, near or within which it originates, and by its date—the double nomenclature serving to determine its position in space and time. With regard to the latter element, absolute uniformity prevails. The year, month, and day are always given, except for great and long-past earthquakes, for which the year only is sufficient. My object in this letter is to suggest the desirability of similar uniformity in the use of the place-name.

Nearly all seismologists have a different standard for earthquakes of their own country and for those of distant lands. An Italian, for instance, will speak of a Benevento earthquake or a Neapolitan earthquake, but also of an Indian earthquake, or even of an Asiatic or Pacific Ocean earthquake. Temporarily, no doubt, the use of the country's name is convenient; but, as every country contains many seismic regions, its continuance is undesirable. Even in the same country various methods prevail. Thus, Indian seismologists describe a Bengal, a Kashmir, and a Kangra earthquake.

These variations in nomenclature are clearly inconvenient. On the one hand, different names are given to the same earthquake. Thus, one may be called the East Anglian, the Essex, or the Colchester earthquake; another the Indian, the Assam, or the Calcutta earthquake. On the other hand, the same name is applied to earthquakes with different origins. In the writings of Italian seismologists, the terms "Calabrian earthquake" is of frequent occurrence. As a family or generic name it is useful, but it groups together earthquakes which belong, as Dr. M. Baratta has shown, to eleven different seismic zones. Thus the six great earthquakes of the Calabrian series of 1783 affected in succession the Palmi, Scilla, Monteleone, Messina-Scilla, Monteleone, and Girifalco zones, and might with advantage have been designated by their names. Again, the earthquake of 1638 occurred in the Nicastro zone, that of 1659 in the Monteleone zone, that of 1836 in the Bisagnano zone, that of 1854 in the Cosenza zone, that of 1894 in the Palmi zone, and that of 1907 in the Gerace zone. These earthquakes, in like manner, might be named after the corresponding zones. To this rule, however, there must be occasional exceptions. For instance, the earthquake of 1905 originated in five zones, and it would be out of the question to call it the Palmi-Monteleone-Nicastro-Cosenza-Bisagnano earthquake of 1905. When the epicentre covers so large a part of a province, it establishes a claim for this earthquake to be known as the Calabrian earthquake of 1905.

While adhering so far as possible to prevalent customs in naming earthquakes, and especially adopting those assigned to them by their principal investigators, I would suggest that the choice of names should be determined by the following principles:—

(1) Old and obsolete names of districts, such as East Anglian, should be avoided, as conveying little or no impression of locality to foreign seismologists.

(2) Names of valleys, hills, seas, lakes, or other physical features should not as a rule be used, with perhaps occasional exceptions, such as Exmoor or Ochil, when there are no prominent towns or villages in the neighbourhood of the epicentre.

(3) Names of islands as geographical terms may, however, be usefully employed when the islands are small (as Zante), or perhaps large and not well known (as Formosa), but not when they are large and well known (as Jamaica). Thus, it would be more convenient to speak of the Ischian than of the Casamicciola earthquake, and of the Kingston and Port Royal than of the Jamaica earthquakes.

(4) Whenever possible, the name of a prominent or well-known town near the epicentre should be applied. The term Charleston earthquake, for instance, is more descriptive than the Woodstock-Rantowles earthquake, though these places are much closer to the double epicentre.

(5) If there is no large town near the epicentre, the name of a small town or village (with that of the province or county added in brackets) may be used with advantage, such as the Viggianello (Basilicata) earthquake of 1894, or the Strontian (Inverness-shire) earthquake of 1902.

(6) When the epicentral area is of considerable size, the name of a single town ceases to convey the desired impression, and the names of many places would be cumbrous. Thus, an earthquake with an epicentral area at least 290 miles in length deserves the name of Californian rather than that of San Francisco. An earthquake which originates in five seismic zones, which are often disturbed separately, is, as already mentioned, suitably described as a Calabrian earthquake.

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[1] With such a short range of ω it is not easy to distinguish log ω from α. For convenience, ω and α are both shown on this scale, as well as log ω and log α.

[2] The figure for lead is for the characteristic X-ray.

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